

SUPPORT FOR THE AMENDMENTS

Claims 1-16 were previously canceled.

Claims 19-25 and 27-28 are amended to depend from and/or recite correct antecedent basis to Claim 17.

Claims 21 and 33 are amended to correct an obvious typographical error.

Claims 24 and 36 are amended to delete the wording "such as chlorine or bromine."

Claims 27 and 28 are amended to recite "further comprising" with regard to initiator and chain transfer agent, respectively.

Support for the amendment of Claim 29 is found on page 18, lines 12-16, in the specification.

Claims 31-37 are amended to depend from and/or recite correct antecedent basis to Claim 29.

No new matter is added to this application by entry of these amendments.

Claims 17-39 are active.

REMARKS/ARGUMENTS

The claimed invention provides a process to prepare a vinyl aromatic copolymer reinforced with rubbery particles according to Claims 17 and 29 and claims dependent thereon and the reinforced vinyl aromatic polymer made thereby.

Applicants respectfully note that the dependent claims 19-28 and 31-39 depend from Claims 17 and 29 respectively and are descriptive of the processes according to the claimed invention.

The rejection of Claims 17 and 25-27 under 35 U.S.C. 103(a) over Demirors et al. (U.S. 6,545,090) in view of Echte et al. (U.S. 4,493,922) with supporting evidence of CRC

Handbook of Solubility Parameters and Other Cohesion Parameters (Barton, Edition 2, 1991, page 406) is respectfully traversed.

Demirors describes a continuous process for preparing a rubber reinforced vinyl aromatic (co)polymer wherein the reinforcing material contains rubber particles having a high molecular weight component and a low molecular weight component (Abstract, Claim 1). During the polymerization process a portion of the rubber particles is grafted to the formed polymer such that a greater proportion of the high molecular weight rubber is grafted and thereby the high molecular weight rubber is separated from the low molecular weight material (Col. 8, lines 18-61). The high molecular weight rubber and low molecular weight rubber may be of the same chemical composition (Col. 3, line 65 – Col. 4, line 45) and star or radial polymers are preferred.

Demirors describes the following (Col. 6, lines 5-9):

The product of the present invention can be viewed as having a **generally broadened rubber particle size distribution**. In one embodiment the present invention has a bimodal rubber particle size distribution with a **critical amount of large and small rubber particles**. (Bold added for emphasis).

In contrast, the claimed invention recites a “strictly bimodal morphology” for the rubber particles and Applicants have described the meaning of this phrase, beginning on page 1, line 14 and bridging to page 2, as follows:

The term "strictly bimodal distribution or morphology" as used in the present description and claims, indicates a series of rubber particles, randomly dispersed inside a rigid polymeric matrix, in which said particles have a bimodal morphology exclusively represented by a first class of particles (prevalent modal class) with a capsule or "core-shell" structure, having an average volume dimension ranging from 0.15 to 0.25 μm and a second class of particles (subvalent modal class) with a so-called "salami" structure, having an average volume dimension ranging from 1 to 5 μm and **the complete absence of particles with an intermediate structure or dimension between said two classes**. (Bold added for emphasis)

Moreover, according to the claimed invention, the rubber of solubility parameter δ_1 and the rubber of solubility parameter δ_2 are incompatible, with $\delta_1 - \delta_2 \geq 0.5$. Applicants have described (page 11, line 14, bridging to page 12):

Elastomeric products capable of providing a rubbery phase dispersed in the rigid polymeric matrix in the form of grafted and occluded particles with a "salami" morphology, are selected from homopolymers and copolymers of olefins or 1,3 alkadienes **incompatible with the elastomeric products which produce the capsule rubbery phase**. The criterion for choosing said incompatible elastomers is that the difference between the solubility parameter (δ), according to Hildebrand, of the elastomer which produces the "capsule" rubbery particles and the solubility parameter, again according to Hildebrand, of the elastomer which produces the "salami" rubbery particles, is higher than or equal to 0.5. Information on the solubility parameter can be found in "CRC Handbook of Polymer-Liquid Interaction Parameters and Solubility Parameters"--Allan F. M. Barton--CRC Press Boca Raton, Boston. (Bold added for emphasis)

According to the present invention, a perfect bimodality is obtained during the polymerization due to the opposing behavior of the two incompatible rubber materials leading to the different morphology of the particles. Thus intermediate size particles which would adversely affect the physical properties such as impact resistance and gloss are not formed.

The Office has acknowledged that Demirors does not teach solubility parameters δ of the rubber components nor states the rubber particles having a difference in solubility parameter $\delta_1 - \delta_2 \geq 0.5$ (Official Action dated October 7, 2009, page 5, lines 15-16). Echte is cited as showing particles of bimodal distribution.

Echte describes a thermoplastic molding material containing polystyrene as the matrix and dispersed in the matrix, two particle types differing in size and morphology (Abstract). The reference describes production of the molding material either by a blending method (Example 1) or by preparation of two prepolymer mixtures and mixing them to complete polymerization (Example 3).

Thus Echte mixes two preformed HIPS materials, differing in that one contains a distribution of small particles while the other contains a distribution of large particles.

Applicants submit that nowhere does either reference disclose or suggest polymerization of a monomer solution containing incompatible types of reinforcing particles as recited in Claims 17 and 29 of the present invention.

In contrast, Applicants have surprisingly discovered that a rubber reinforced vinyl aromatic (co)polymer having a strictly bimodal morphology of reinforcing particles can be obtained by a single polymerization of vinyl aromatic monomer(s) when the rubber components are both dissolved in the monomer solution and satisfy the relationship $\delta_1 - \delta_2 \geq 0.5$.

Barton is cited to show δ values and provides no description of a process for the preparation of rubber-reinforced vinyl aromatic (co)polymer.

In discussion of “**Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in *KSR International Co. v. Teleflex Inc.***” the Office has stated:

“The rationale to support a conclusion that the claim would have been obvious is that **all the claimed elements were known in the prior art** and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded nothing more than predictable results to one of ordinary skill in the art at the time of the invention. “[I]t can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.” **If any of these findings cannot be made, then this rationale cannot be used to support a conclusion that the claim would have been obvious to one of ordinary skill in the art,**” (Federal Register, Vol. 72, No. 195, page 57529) (Bold added) (Citations omitted)

As discussed above, Applicants respectfully submit that the cited combination of references does not describe or suggest each and every limitation of the claimed invention and therefore, the a conclusion of obviousness over the cited references cannot be supported. Accordingly, Applicants respectfully request that the rejection of Claims 17 and 25-27 under 35 U.S.C. 103(a) over Demirors in view of Echte with supporting evidence of CRC Handbook of Solubility Parameters and Other Cohesion Parameters be withdrawn.

The rejections of Claims 18-24 under 35 U.S.C. 103(a) over Echte, Barton and Demirors are respectfully traversed.

Applicants note that Claims 18-24 depend directly or indirectly from Claim 17 and as amended herein are directed to a process. The deficiencies of the cited combination of references relative to rendering the independent claim obvious are described above and apply to these rejections, as well. Accordingly, Applicants respectfully request that the rejections be withdrawn.

The rejection of Claims 29 and 37-39 under 35 U.S.C. 103(a) over Demirors et al. (U.S. 6,545,090) in view of Echte et al.(U.S. 4,493,922) with supporting evidence of CRC Handbook of Solubility Parameters and Other Cohesion Parameters (Barton, Edition 2, 1991, page 406) is respectfully traversed.

Claim 29 recites "strictly bimodal morphology" and $\delta_1 - \delta_2 \geq 0.5$. The failure of the cited combination of references to disclose or suggest at least these descriptions is described above. Therefore, Applicants submit that the cited combination of references cannot render the present invention obvious and withdrawal of the rejection of Claims 29 and 37-39 under 35 U.S.C. 103(a) over Demirors in view of Echte with supporting evidence of CRC Handbook of Solubility Parameters and Other Cohesion Parameters is respectfully requested.

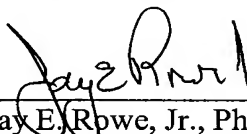
The rejections of Claims 30-36 under 35 U.S.C. 103(a) over Echte, Barton and Demirors are respectfully traversed.

Applicants note that Claims 30-36 depend directly or indirectly from Claim 29 and as amended herein are directed to a process. The deficiencies of the cited combination of references relative to rendering the independent claim obvious are described above and apply to these rejections, as well. Accordingly, Applicants respectfully request that the rejections be withdrawn.

Applicants respectfully submit that the above-identified application is now in condition for allowance and early notice of such action is earnestly solicited.

Respectfully submitted,

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